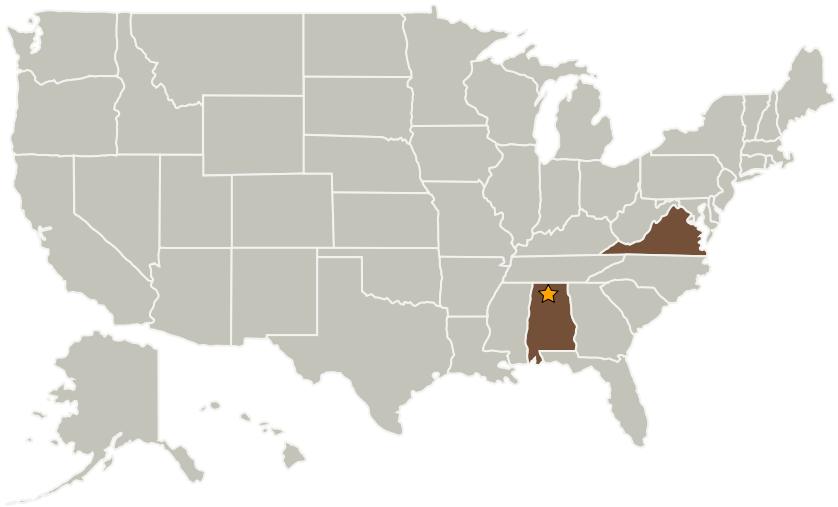
On-Line Trajectory Retargeting for Alternate Landing Sites, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

Barron Associates, Inc. proposes to develop a novel on-line trajectory optimization approach for Reusable Launch Vehicles (RLVs) under failure scenarios, targeting alternative abort-landing sites. Key features of the proposed approach are: An innovative on-line optimization approach: By describing decision variables (variables whose optimal solutions are sought) in terms of appropriate basis functions, the trajectory optimization problem can be reformulated to find the relatively few basis function coefficients that characterize the desired trajectory. This significantly reduces the search domain, enabling rapid convergence to feasible solutions. This key idea will be coupled with a numerical optimization approach known as Piecewise Linear Programming (PLP), which has been used successfully in related programs requiring on-line, real-time optimal solu-tions. A generic bootstrapping capability: To improve the speed and robustness of the on-line procedure, a method will be developed to generate initializing trajectories for the on-line optimization that are suitable for all recoverable ranges, vehicle configurations, energy conditions, and abort scenarios. Phase I simulation studies will demonstrate on-line generation of alternative re-entry trajectories for dif-ferent landing targets and vehicle configurations. Computation time and accuracy will be assessed from the simulation studies.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Barron Associates, Inc.	Supporting Organization	Industry	Charlottesville, Virginia

Primary U.S. Work Locations	
Alabama	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John D Schierman

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.2 Flight Mechanics
    - TX15.2.1 Trajectory Design and Analysis